GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. ____

Project No. A-3676 GTRI/~~GIT~~ DATE 10 / 7 / 83

Project Director: H. W. Denny ~~School~~/Lab ECSL/ECD

Sponsor: U. S. Army Construction Engineering Research Laboratory, Champaign, IL

Type Agreement: Unpriced Purchase Order DACA88-83-M-0855

Award Period: From 9/19/83 To 6/30/84 (Performance) 6/30/84 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated:	$ 24,900	$ 24,900
Funded:	$ 24,900	$ 24,900*

Cost Sharing Amount: $ ____ Cost Sharing No: ____

Title: Conduct an EMP Workshop

ADMINISTRATIVE DATA OCA Contact Brian J. Lindberg X4820

1) Sponsor Technical Contact:

Ray McCormick
U. S. Army Construction Engineering
Research Laboratory
Interstate Research Park
Newman Drive - P.O. Box 4005
Champaign, IL 61820

2) Sponsor Admin/Contractual Matters:

Robert Cylkowski
U.S. Army Construction Engineering
Research Laboratory
Interstate Research Park
Newman Drive - P.O. Box 4005
Champaign, IL 61820

Defense Priority Rating: DO C-2

Military Security Classification: N/A

(or) Company/Industrial Proprietary: N/A

RESTRICTIONS

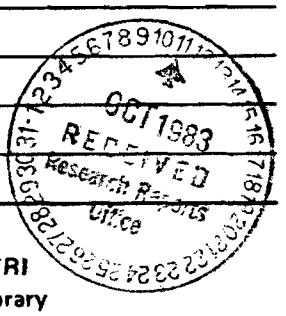
See Attached N/A Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with N/A - none proposed.

COMMENTS:

* Unpriced Purchase Order not to exceed $24,900.



COPIES TO:

Project Director (Denny)
Research Administrative Network
Research Property Management
Accounting

Procurement/EES Supply Services
Research Security Services
(Reports Coordinator (OCA))
Research Communications (2)

GTRI Library
Project File
Other I. N.

FORM OCA 4-282

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 8/1/84

Project No. A-3676 School/Lab ECSL

Includes Subproject No.(s)

Project Director(s) H.W. Denny GTRI / ~~GIT~~

Sponsor Army Construction Engineering Research Lab, Champaign, IL

Title Conduct an EMP Workshop

Effective Completion Date: 6/30/84 (Performance) 6/30/84 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [X] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. Continued by Project No.

COPIES TO:

Project Director
Research Administrative Network
Research Property Management
Accounting
Procurement/EES Supply Services
Research Security Services
Reports Coordinator (OCA)
Legal Services
Library
GTRI
Research Communications (2)
Project File
Other I. Newton

Form OCA 60:1028

A-3676

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
Atlanta, Georgia 30332

10 July 1984

Department of the Army
Construction Engineering Research Laboratory
Interstate Research Park
Newman Drive
P. O. Box 4005
Champaign, IL 61820

Attention: Mr. Robert Cylkowski

Subject: Report on Project A-3676, Contract No. DACA88-83-M-0855, "Services to Provide a Workshop at CERL, Champaign, Illinois," covering the period from 19 September 1983 to 30 June 1984.

Gentlemen:

The objective of this program was to assist the Construction Engineering Research Laboratory organize and present a Workshop on EMP Hardening of C^3I Facilities. A list of applicable topics and candidate speakers was compiled and finalized with CERL's approval. The final agenda was prepared and the Workshop was scheduled for 28 February through 2 March 1984. A list of invitees was jointly prepared with CERL and invitations mailed.

A sudden winter snowstorm in Champaign, Illinois forced rescheduling of the Workshop to 17-19 April 1984. A summary report on the Workshop and its findings is attached along with a copy of the final program and a list of registrants.

A comprehensive report on the Workshop is under preparation under Contract No. DACW88-84-M-1007.

Respectfully submitted,

H. W. Denny
Director, Project A-3676

Approved:

F. L. Cain, Director
Electronics and Computer Systems Laboratory

WORKSHOP ON EMP HARDENING OF C^3I FACILITIES

17-19 April 1984
U.S. Army Corps of Engineers
Construction Engineering Research Laboratory
Champaign, Illinois

Many of the nation's C^3I facilities are potentially susceptible to, and thus require protection from, the EMP threat. These facilities have been constucted at varying times relative to state-of-the-art changes in EMP technology. When the construction occurred, the EMP state of the art was less mature than at present and, hence, the facilities have varying degrees of EMP hardness. Independent studies have identified a number of facilities whose mission is sufficiently critical to require protection against EMP. An effort is currently underway to assess and, if necessary, upgrade the EMP hardness of several of these facilities. In developing criteria and designs for the assessments and upgrades, it appears that technology gaps still remain in the EMP state of the art. A need exists, therefore, for clearly identifying these gaps and for formulating measures to bridge the gaps. As a means of assimilating information and data concerning EMP technology gaps, this three-day workshop was held.

The purposes of the workshop were to (1) briefly assess the state of the art in various areas associated with the design, construction, and maintenance of EMP-protected facilities, and (2), from this assessment, identify existing technological deficiencies. To these ends, presentations in a broad range of EMP topics were made by invited speakers. A copy of the agenda is attached. A total of forty-eight attendees were registered; a final listing of the registrants is also attached.

To identify the major voids presently existing in C^3I facility EMP protection, the following approach was used:

(1) Each speaker was asked to highlight particular needs in his/her area of emphasis;

(2) As a part of the question and answer period following each talk, the major issues of concern in the particular topic area were identified with inputs from the speaker and the workshop audience;

(3) At the end of the day, common voids spanning multiple topic areas were identified;

(4) In an overview closing session, the workshop participants jointly highlighted overall concerns ranging from as general as the need for performance criteria to as specific as how to test as-installed filters; and

(5) Each attendee was asked to complete a "Needs Assessment Questionnaire" on which they noted the technology voids of direct concern to them.

Based upon the presentations and the results of the above five-step process, seven general categories of needs or voids were identified. The categories are:

I. Performance Criteria
II. Testing
III. Specifications and Standards
IV. Penetrations
V. Technical Guidance
VI. Hardening Alternatives
VII. Corporate Memory

Much overlap exists between these areas; clear lines of demarcation can not be drawn. In addition, several individual, and technically focused needs were named which should be addressed as separate items. (These individual needs will be identified in the final documentation on the workshop.)

Performance Criteria. The need for accepted and justified performance criteria for all aspects of an EMP hardened C^3I facility was repeatedly stressed. Levels of performance required on facility elements ranging from overall structural shielding effectiveness to power line filter attenuation were identified as being strongly needed from both technical and contractual perspectives. Wherever possible, these performance criteria need to be kept unclassified.

Testing. Testing, for overall EMP hardness as well as for the performance of shields, penetrations, filters, transient suppressors, etc., is a clear technological void. Numerous questions relating to testing were raised. Typical of these questions were:

- o What is the relationship of test results to facility hardness?
- o How are MIL-STD-285 test results related to the EMP hardness offered by a shielded room?
- o How do the results obtained on a shielded enclosure before penetrations are made compare with the overall shielding effectiveness with penetrations installed?
- o Which tests should be threat level and which should be non-threat level?
- o Which tests can be conducted by uncleared contractors?
- o How can power line filters be tested so as to properly reflect as-installed performance?

Specifications and Standards. The need for specifications and standards covering performance, testing, and installation practices is pervasive. The breadth of this need ranges from standards for the construction and testing of shielded rooms to specifications for terminal protection devices.

Penetrations. Penetrations of communications, power, and utilities into protected areas tend to be special designs for each facility. The need for generic designs and standardized methods of treatment was identified. Realistic levels of achievable hardening of penetrations need to be quantified. Simple and meaningful methods for testing the effectiveness of penetration treatments need to be developed. Realistic maintenance programs need to be developed and implemented.

Technical Guidance. In spite of the broad array of technical literature produced by and for the electromagnetic specialist, a serious lack of design, installation, and maintenance information is available for the nonspecialists such as architects, structural/building engineers, and maintenance personnel. A need for simple test procedures, maintenance program procedures, and construction guidelines was highlighted.

Hardening Alternatives. Currently, the hardening of new facilities against EMP is typically met through total metal shielding. Many existing facilities strongly suggest the use of less comprehensive measures. Unfortunately little or no data exist as to the effectiveness of the alternative measures. Guidance for the design and installation of less-than-solid shields needs to be developed.

Corporate Memory. Methods and procedures need to be developed and implemented that will allow the experiences gained on the design of one facility to be effectively applied to the next facility. These methods and procedures must reflect that different individuals and even organizations may be involved with the separate facilities.

The above seven categories of needs are not necessarily all inclusive of every void which was named during the Workshop. Nor does the ordering represent consensus priortization of the voids.

The next planned step is that of compiling a listing of the separate needs. This list will then be distributed to the Workshop participants to solicit their inputs as to the voids considered to be of maximum concern. The results will be tabulated and will form the basis for the final ranking.

The final summary report of the Workshop will contain the priortized listing along with indicated courses of action to fill the major voids.

TECHNICAL PROGRAM

CERL WORKSHOP
ON
EMP HARDENING OF C^3I FACILITIES

Champaign, Illinois
17-19 April 1984
Workshop Moderator, Hugh Denny, Georgia Tech

TUESDAY, April 17, 1984		
0800	Registration	
0900	Welcome and CERL Overview	Ltc. John Wettack, CERL
0945	Introductory Remarks	Charles D. Smith, Office of Chief Engineers
1000	Workshop Overview	Ray McCormack, CERL
1010	Break	
1030	"PREP Overview"	A. Thomas Bolt, USA Engineer Division, Huntsville
1130	Lunch	
1245	"Internal Response of Sheltered Systems"	Rodney Perala, EMA, Inc.
1345	"Shielding Techniques for C^3I Facilities"	G. E. Morgan, Rockwell International
1445	Break	
1500	"DoD EMP Standardization Program"	Joan Ma Pierre, Defense Nuclear Agency
1600	"Procedures for Hardening C^3I Facilities	John Zych, USAF Communications
1730-1900	Social	
1900-2100	Dinner	

(continued)

TECHNICAL PROGRAM
(Continued)

WEDNESDAY, April 18, 1984

0800	"Hardness Assurance"	John Frisbie, Air Force Weapons Laboratory
0900	"Validation Confidence"	Dr. Singaraju, Air Force Weapons Laboratory
1000	Break	
1015	"Low cost Facility Test Techniques"	Lin Albright, Booz-Allen, Hamilton, Inc.
1115	"No-Disruptive Testing"	Arthur G. Foster, Ogden Air Logistics Command
1215	Lunch	
1330	"Physical Scale Modeling for EMP Validation"	James Loftus, USA Harry Diamond Laboratories
1430	"Lightning -- Its Use in EMP Testing"	Ed Vance, SRI International
1530	Break	
1550	"The Role of Computers in EMP Validation"	W. Cooley, Boeing Computer Services
1650	Adjourn	

THURSDAY, April 19, 1984

0800	"Implementation of System EMP Protection"	Deane Parker, Defense Communications Agency
0900	"Hardening Deterioration"	Ray McCormack, USA-CERL
1000	Break	
1020	"Integrated Grounding and Bonding"	Hugh Denny, Georgia Tech
1120	Lunch	
1245	Workshop Session	
1445	CERL Tour	
1545	Compilation of Workshop Findings and Discussion of Technology Voids	
1645	Wrap-Ups, Summary, etc.	
1700	Adjourn	

EMP WORKSHOP ATTENDANCE LISTING
17-19 APRIL 1984

Albright, Linden	Booz-Allen & Hamilton	301-951-2567
Bolt, Tom	USAEDH	205-895-5670
Brooks, Jim	Naval Civil Eng. Lab	805-982-4660
Byrd, Charles	HQ USA AFB	202-697-8222
Castillo, Phil	RDA	505-842-8156
Chase, Ron	Harry Diamond	703-490-2319
Chivington, Paul	TRW	505-242-8980
Cikotas, Bron	DNA	
Cooley, Bill	Boeing	
Connell, Pat	USACC	602-538-7898
Crevier, Bill	Mission Research/SB	805-963-8761
Croisant, Bill	USA CERL	217-352-6511 EX:473
Denny, Hugh	Georgia Tech	404-894-3535
Dorchak, Ed	BDM Corp.	703-827-7740
Drain, Al	FEMA	202-566-0217
Duerksen, Gary	AT&T Bell Lab	201-949-7323
Durgin, Davd	Booz-Allen & Hamilton	301-951-2602
Ege, Ron	USAAF	617-861-5457
Evans, Tom	OCE	
Foster, Glen	OGDEN ALC	801-777-6301
Frisbie, John	AFWL/NTCA	244-0116
Godfrey, Tom	USA NRDC	617-651-5247
Goldstein, Les	Oma Dist. Corps of Eng.	402-221-3050

Hale, Les	Penn State	814-865-6337
Hollis, Harold	FESA	203-664-3324
Howdyshell, Paul	USA CERL	217-352-6511 EX:244
Jurgins, Tom	IIT Research Institute	312-567-4508
Knapp, John	Naval Facil. Eng. Comm.	202-325-0260
Loftus, Jim	Harry Diamond	703-490-2319
Loyd, John	USA EDH	205-895-5671
Martin, Leroy	UNL	415-422-8937
Mittra, Raj	Univ. of Illinois	217-333-1202
McCormack, Ray	USA CERL	217-352-6511 EX:246
Moore, John	USACC	602-535-6732
Morgan, Gene	Rockwell	714-632-1903
Nielsen, Paul	USA CERL	217-352-6511 EX:243
Parker, Deane	DCA	202-692-8883
Perala, Rod	EMA	
Pierre, Joan	DNA	202-325-7016
Randall, Ron	BDM	505-848-5293
Shapiro, Howard	OJCS	224-5651
Singaraju, B.	AFWL	244-0601
Smith, Charles	OCE	
Vance, Ed	SRI	817-478-5653
White, Louis	HQ USA AFB	202-694-5115
Woody, Jimmy	Georgia Tech	404-894-3533
York, Ed	Boeing	
Zych, John	USAF, AFCC	618-256-2661